RV Educational Institutions

RV Institute of Technology and Management®

Bangalore – 560076

Department of Computer Science and Engineering

Event Name	Faculty Development Program on Generative AI (BAIL657C): Hands-On Learning from Concepts to Applications
Date	3rd February to 7th February, 2025
Venue	6th Floor seminar hall, RVITM
Audience	Faculty members / Research scholars from HEIs / Industry professionals
Coordinators	Dr.Hema, Professor, Dr Roopashree S, Assistant Professor, Ms.Bhavya Jayagal Assistant Professor, Ms.Sridevi, Assistant Professor

Objectives of the Program:

- Provide faculty members and researchers with knowledge and practical skills in generative AI technologies.
- Cover fundamental topics such as Word embeddings, Dimensionality reduction, Vector arithmetic for word relationships
- Hands-on experience in Prompt engineering, Sentiment analysis, Text summarization, and working with pre-trained models (e.g., Hugging Face)
- Develop insights into transformers and their applications in real-world AI tasks.
- Help participants stay updated with the latest advancements in AI and generative models.
- Provide a lab manual for faculty and practical solutions aligned with the **VTU syllabus on Generative AI (BAIL657C) for the sixth semester**.

Outcomes of the Program

- Analyzing word embeddings to identify patterns
- Designing effective prompts for generative AI tasks
- Utilizing pre-trained models for real-world applications
- Understanding transformer architecture
- Opportunity to develop a lab manual for the new course “GenAI - BAIL657C” introduced by VTU for the sixth semester.

RV Educational Institutions

RV Institute of Technology and Management®

Bangalore – 560076

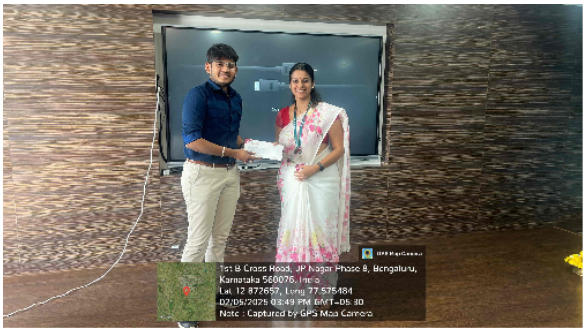
Topics Covered:

Day 1 (03-02-2025)

- Basics of Natural Language Processing (NLP)
- Dimensionality Reduction Techniques & Word Embeddings
- Hands-on Session 1 & 2

Day 2 (04-02-2025)

- Fundamentals of Generative AI and Large Language Models (LLMs)
- Pre-trained Vector Models
- Hands-on Session 1 & 2



Day 3 (05-02-2025)

- Transformers: Pre-trained Models & Hugging Face
- LangChain (for AI workflow automation)
- Hands-on Session 1 & 2

Day 4 (06-02-2025)

- Pydantic Models
- Prompt Engineering
- Hands-on Session 1 & 2

RV Educational Institutions

RV Institute of Technology and Management®

Bangalore – 560076

Day 5 (07-02-2025)

- Understanding Retrieval-Augmented Generation (RAG)
- Chatbot Development
- Hands-on Session 1 & 2

Brief Report:

The Department of Computer Science and Engineering at RVITM recently organized a Faculty Development Program (FDP) on Generative AI (BAIL657C): Hands-On Learning from Concepts to Applications for faculty members and researchers. A total of 40 participants registered for the FDP. The five-day program was conducted from February 3rd to February 7th, 2025, covering key topics such as Natural Language Processing (NLP), Large Language Models (LLMs), Transformers, Prompt Engineering, and Chatbot Development. **The sessions were led by renowned industry experts, including Dr. Karthikeyan Saminathan, Mr. Saran, Dr. Satya Narayanan, and Mr. Sudhakar, providing both theoretical insights and hands-on training to equip participants with** practical AI skills applicable in academia and industry.
Dr. Karthikeyan Saminathan, Founder CEO & Head-AI AIQuantalytics, Bengaluru, was the resource person for Day 1, where he provided an in-depth understanding of Natural Language Processing (NLP) and Word Embeddings. The session covered NLP fundamentals, including tokenization, stemming, lemmatization, POS tagging, Named Entity Recognition (NER), and dependency parsing, along with practical applications like sentiment analysis, text classification, machine translation, and chatbots. Dr. Karthikeyan also introduced Word Embeddings, explaining methods such as One-Hot Encoding, Word2Vec (CBOW & Skip-gram), GloVe, and FastText, which enhance AI models' ability to understand word relationships. Participants explored the implementation of machine learning techniques like RNNs, CNNs, LSTMs, and Transformers (BERT, GPT) for NLP applications. Through hands-on training and real-world examples, this session empowered educators and researchers to develop AI-driven solutions for academia and industry.

Dr. Karthikeyan Saminathan, Founder CEO & Head-AI AIQuantalytics, Bengaluru, as the resource person for day 2, where he provided session on Generative AI and Large Language Models (LLMs) covered the fundamentals of LLMs, Transformer architectures, model training, and real-world applications. LLMs are machine learning models trained on massive datasets to predict text based on statistical patterns. These models have billions of parameters and rely on self-attention mechanisms to process language efficiently. The session introduced pre-training and fine-tuning methods, explaining how models like GPT and BERT use masked and causal language modeling for learning contextual representations.

Key topics included Prompt Engineering, where different prompting strategies such as zero-shot, one-shot, and few-shot learning were discussed. The Transformer model architecture was explained, detailing the role of multi-headed self-attention, embeddings, positional encoding, and softmax layers in text generation. The session also explored Retrieval-Augmented Generation (RAG) to enhance LLMs with external knowledge, fine-tuning strategies for domain adaptation, and Reinforcement Learning from Human Feedback (RLHF) for improving model alignment with human preferences. Practical applications, including chatbots, text summarization, translation, and AI-powered assistants, were demonstrated, equipping participants with the knowledge to develop and optimize AI-driven solutions.

Additionally, Dr. Karthikeyan conducted a hands-on session covering the first five programs from the VTU Generative AI syllabus, providing practical exposure to LLM implementation, text processing, and model fine-tuning.

The session on Day 3, led by Mr. Saran, AI Analyst MathCo, Bengaluru,focused on Transformers, Large Language Models (LLMs), and LangChain, covering their evolution, capabilities, and applications. The session began with an overview of Machine Learning (ML), Deep Learning (DL), and Generative AI (GenAI), highlighting the rise of Transformers as a breakthrough over traditional models like RNNs and LSTMs, which struggle with long-range dependencies and sequential processing limitations.
Key topics included:

- Transformer Architecture: Introduction to self-attention mechanisms, positional encoding, and attention layers, making transformers scalable, efficient, and adaptable for various language tasks.

- Evolution of LLMs: Explanation of pre-trained foundation models, their stages (pre-training, fine-tuning, and deployment), and how they power modern AI applications.

- Hugging Face & LangChain: Discussion on the Hugging Face ecosystem, including pre-trained models, APIs, and frameworks that simplify LLM implementations. LangChain was introduced as a tool for building AI-driven applications, enabling seamless integration of LLMs with external data sources.

- Text Summarization: Practical demonstration of how LLMs can generate concise summaries from large text data using transformers and prompt engineering.

Mr. Saran further led the hands-on session for the 6th and 7th programs from the VTU syllabus, allowing participants to gain deeper practical insights into advanced generative AI techniques and model deployment

Day 4 session began with the introduction to Pydantic Models led by Dr. M S Satyanarayana, Manager-Customer Application Development Canopus GBS Pvt. Ltd., Bengaluru, where he shared his knowledge on Pydantic models and prompt engineering play crucial roles in AI and machine learning applications. Pydantic models, built on Python's Pydantic library, enable data validation and parsing using Python type hints, ensuring structured and error-free data handling. These models are widely used in FastAPI and other frameworks to maintain data integrity. On the other hand, prompt engineering is the process of crafting effective prompts to optimize the output of AI models, such as large language models (LLMs). By carefully designing prompts, developers can improve model accuracy, generate more relevant responses, and achieve specific outcomes. Together, Pydantic models and prompt engineering contribute to building robust AI applications by ensuring reliable data management and effective human-AI interactions.

On Day 5, Mr. Sudhakar, Advisory Software Engineer IBM, Bengaluru conducted a hands-on session focused on chatbot development using Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG). The session covered document chunking, vector databases, and retrieval mechanisms, enabling participants to build intelligent AI-driven chatbots capable of retrieving contextually relevant responses.

This session provided comprehensive practical exposure to developing AI-powered assistants that leverage document-based retrieval, vector databases, and LLM inference, ensuring participants gained hands-on experience in chatbot deployment and real-world AI applications.

RV Educational Institutions

RV Institute of Technology and Management®

Bangalore – 560076

Dr. Satya Narayanan provided research insights and future directions in Generative AI, emphasizing applications in healthcare, finance, education, and creative AI. The session covered:

- Ethical and Responsible AI Development.
- Fine-Tuning LLMs for domain-specific applications.
- AI in Content Generation, Automated Knowledge Extraction, and Personalized Learning.
- Challenges in Scaling LLMs (Compute Power, Bias, and Data Limitations).

- Research opportunities in RAG-based architectures, Efficient Model Compression, and Human-AI Collaboration.

Additionally, hands-on sessions covered Programs 8 and 9 from the VTU syllabus, focusing on advanced AI integrations, API handling, and cloud-based model deployment.

We extend our heartfelt gratitude to the Management of RV Educational Institutions for their continuous support and encouragement in organizing the Faculty Development Program (FDP) on Generative AI. Their vision and commitment to academic excellence have been instrumental in fostering research and innovation at RVITM.

A special thanks to our Principal, Dr. Nagashetappa Biradar, and Vice Principal, Dr. Manjunath Prasad R for their unwavering support and guidance throughout the FDP. Their encouragement has played a pivotal role in ensuring the success of this program and enhancing the learning experience for all participants.

RV Educational Institutions

RV Institute of Technology and Management®

Bangalore – 560076

We sincerely appreciate the contributions of Dr. Mallini N Patil, Head of the Department, Computer Science and Engineering, RVITM, for her leadership and invaluable support in making this FDP a grand success. Her dedication to advancing knowledge in the field of AI has greatly benefited all attendees.

We also express our gratitude to the FDP Coordinators, Dr. Hema M S (Professor), Dr. Roopashree S (Assistant Professor), Ms. Bhavya Jayagal (Assistant Professor), and Ms. Sridevi (Assistant Professor), for their meticulous planning, dedication, and seamless execution of the sessions. Their efforts ensured that the program provided valuable insights, hands-on training, and research opportunities in Generative AI.

Lastly, we extend our sincere appreciation to all resource persons, faculty members, and participants for their active involvement and enthusiasm, making this FDP a truly enriching and impactful experience for everyone.

Coordinator Signature **HOD's Signature**